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Two New Acontiate New Zealand Sea Anemones

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Abstract

A new genus and two new species of acontiate sea anemones are described in detail. The mode of development of the mesenteries as well as the total morphology of one of these suggests that the acontiate thenarian anemones have been derived from the acontiate athenarian anemones. The family Acontiophoridae to which one new species belongs is new to the New Zealand fauna, having previously been known only from South Africa.

The second anemone is a species of *Flosmaris*, a previously monotypic genus known only from the Maldive Islands. The family, Isophelliidae, to which *Flosmaris* is assigned, is also new to the New Zealand fauna. The occurrence of catch-tentacles in this species is the first record of their presence in this family.

PART I. *Mimetridium cryptum* n.g., n.sp.

IN a short paper on some sea anemones from the Kermadec Islands, Stuckey (1914, p. 134) described a new species which he named *Metridium canum*. Carlgren in his 1949 (p. 106) "Survey" of the sea anemones of the world, questioned whether this species was indeed a *Metridium*. The basis for this query was undoubtedly founded first on the general inadequacy and vagueness of Stuckey's description, and second, upon the fact that up to 1949 there was but one well accepted species in that genus, that being the well known *Metridium senile*. In 1951 (p. 89) Parry listed *Metridium canum* from the Heathcote Estuary at Christchurch and in an Addendum on p. 119 added that Dr. E. J. Batham had found a species of *Metridium* which was probably *M. canum* in Otago Harbour. Parry (1952, p. 133) in the second part of her study of New Zealand anemones described *M. canum* in considerable detail, basing her description on material from the Heathcote Estuary. A brief note on the appearance and habitat of the Otago Harbour *Metridium canum* was provided by Ralph and Yaldwyn (1956, p. 68) and a comparison of the mesenteric nerve net of *M. canum* and *M. senile* was made by Batham (1956, p. 91). One additional bit of information on

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M. canum is to be found in Grimstone, Horne, Pantin and Robson (1958, p. 538) concerning the banding of mesogloeal fibrils based on data provided by Dr. E. J. Batham. This brief list, just presented, represents the total of the literature on *Metridium canum*.

The family, Metridiidae, to which *M. canum* is assigned, is a small one, consisting of two genera, *Metridium* and *Isometridium*. Excluding *Metridium canum* there are the following species known to date; *Metridium senile* (Linnaeus, 1767, p. 1088); *Metridium exilis* Hand (1956, p. 206); and *Isometridium rickettsi* Carlgren (1949, p. 106). Another species, *M. parvulum,* was described by McMurrich (1904, p. 276) from Chile; however, it has not been established that this is a veritable *Metridium*. The distribution of the valid species of *Metridium* and *Isometridium* is limited to the Atlantic and Pacific Oceans, north of the equator, and the occurrence of a species of *Metridium* in the southern Pacific Ocean was of considerable interest to the writer. Therefore, when the opportunity to work for a period at the Portobello Marine Biological Station materialized, I was very glad to address myself to a careful comparison from the systematic point of view of *M. canum* with *M. senile* and *M. exilis*, having studied the latter two earlier (Hand, 1956, pp. 192 and 206). However, examination of both living and preserved specimens of the Otago Harbour species referred to as *M. canum* soon disclosed that this anemone was not a *Metridium* and in fact represented a family of acontiate anemones, the Acontiophoridae, new to the New Zealand fauna. The anemone also must be referred to a genus and species, new both to New Zealand and to the systematics of the Actiniaria. The description follows.

Family ACONTIOPHORIDAE Carlgren, 1938, p. 65

Thenaria (Acontiaria) without sphincter. Mesenteries divisible into macro- and microcnemes, at least in young individuals. Acontia with basitrichs and microbasic amastigophores.

If the above family definition is compared with that given by Carlgren (1949, p. 87) two minor changes will be noted. First, I have added the qualification "at least in young individuals" with reference to the type of mesenterial arrangement. This is necessitated, as will be detailed below, by the fact that in fully mature anemones one would describe the mesenterial arrangement as that of normal cycles, while it is only the young specimens which possess mesenteries readily designated as micronemes and macronemes. The second change concerns the types of nematocysts possessed by the acontia. Carlgren (1938) had only preserved material of *Acontiophorum mortenseni* available to him, and he stated in his 1949 diagnosis of this family that the acontia "probably" contained microbasic amastigophores. The diagnosis of nematocyst types from preserved material is difficult at best and frequently it is impossible to determine the type of some capsules, while it is considerably easier from live material. Thus, since I have found basitrichs and microbasic amastigophores in the material under study here, it seems safe now to alter the family diagnosis by eliminating the suggestion of doubt implied by the word "probably".

Concerning the nematocysts of this family, one additional word of caution should be inserted here. Carlgren's (1938) description of *Acontiophorum mortenseni* gave a partial account of the nematocysts which he supplemented in 1947. In that latter account he stated (p. 105) that as well as basitrichs there also were ". . . . probably microbasic p-mastigophores" in the acontia. The kinds of nematocysts in the acontia vary from family to family in the Acontiaria, but they are constant within each family. Thus, if further examination of *Acontiophorum* should reveal that the nematocysts of the acontia include microbasic p-mastigophores and not the amastigophores assumed here and by Carlgren (1938, 1949), then the genus described below will have to become a member of a new and as yet unnamed family of acontiate anemones.

Genus MIMETRIDIUM Hand, new genus

Acontiophoridae with well developed base. Column smooth, but divisible into scapus and capitulum and with a definite collar except when fully extended. Cinclides present and numerous on the scapus. No sphincter. Tentacles hexamerously arranged and normal. Longitudinal muscles of tentacles and radial muscles of oral disc ectodermal. Oral disc scalloped into lobes in larger individuals. Two siphonoglyphs. Two pairs of directive mesenteries. Six pairs of macrocnemes are perfect and fertile. One or two additional cycles of mesenteries are developed as macrocnemes and are fertile. The third cycle of mesenteries is macrocnemous only in large individuals; in small individuals it may possess acontia, filaments and parietal musculature, but no retractor or gonad. More mesenteries distally than proximally. Retractor muscles strong; parietal muscles well developed, as are the basilar muscles, acontia numerous; several to each mesentery. Cnidom: spirocysts, basitrichs, microbasic amastigophores and microbasic p-mastigophores.

The new generic name used here is given, not to imply close relationship to *Metridium,* but to signify mimicry in appearance of this anemone to *Metridium.* The lobed oral disc, the numerous tentacles, the colour and many of the attitudes assumed by this species closely simulate those features in *Metridium senile.*

It should be noted here that the family Acontiophoridae, to which *Mimetridium* is assigned, has been known to this date as a monogeneric family, and its single genus, *Acontiophorum,* is itself monotypic. The single species *Acontiophorum mortenseni* Carlgren (1938) is known only from a single specimen collected at 75 metres from Algulhas Bank, South Africa. The new genus, *Mimetridium,* differs from *Acontiophorum* most significantly in having more mesenteries distally than proximally. The unusually numerous acontia may also be an important generic difference, but the significance of this feature cannot be properly evaluated, due to our inadequate knowledge of variations in numbers of acontia in the acontiate sea anemones. For example, of all the acontiate sea anemones of both the tribes Athenaria and Thenaria only two examples of anemones with more than one acontium per mesentery can be cited. One is the athenarian haliactiid *Phytocoetopsis ramunni,* the only species in that genus, while the other is the thenarian aiptasiid *Aiptasia couchii,* one of a genus of about twelve species and the only one in which more than a single acontium per mesentery has been noted (see Stephenson, 1928, p. 45).

Mimetridium cryptum Hand, n.sp.

1914. non *Metridium canum* Stuckey, p. 134.
1949. non *Metridium canum* Carlgren, p. 106.
1951. *Metridium canum* Parry, p. 89.
1952. *Metridium canum* Parry, p. 133.
1956. *Metridium canum* Ralph and Yaldwyn, p. 66, 68; Fig. 14, p. 67.
1956. *Metridium canum* Batham, p. 91 and Pls. 15 and 16.
1958. *Metridium canum* Grimstone *et al.,* p. 538.

DESCRIPTION (see Pl. 1 and Fig. 1).

BASE. Generally circular in outline, adherent and with well developed basilar muscles present. When the anemone is well elongated the base may be twice, or even more than twice, the diameter of the scapus (see Pl. 1, E). The base is used in active burrowing when this species is freed upon a sandy or muddy substrate, and the anemone sometimes actively creeps about on its base in aquaria. The colour of the base in freshly collected specimens is a creamy white, apparently due to a lack both of intrinsic pigment and of symbiotic algal cells. In expanded individuals the base becomes transparent.

Column. Divisible into a scapus and capitulum which are separated by a collar (see Pl. 1, C). In expansion the collar disappears and the column becomes very elongate (see Pl. 1, D, which is the same anemone as Pl. 1, C). In attached animals the scapus is nearly the same diameter throughout except near the base, where it flares towards the limbus. In extreme extension the scapus becomes nearly transparent and its diameter may be only about one-sixth of its length; commonly it tapers gently from the flared base to the collar or collar region. Above the collar the capitulum narrows and then expands again to meet the lobed and widely spread tentaculate margin of the oral disc. The capitulum is slightly thinner and is more transparent than the scapus. In full extension the capitulum is only about one quarter or one-fifth the length of the scapus. The minimal diameter of the

capitulum may be less than one half that of the scapus, or in other poses the diameter of both may be nearly the same. In freshly collected specimens the colour of the capitulum and upper half of the scapus is a light grey-green, sometimes khaki, resulting from the presence of symbiotic algae in the endoderm. This colour fades gradually at about the mid-scapus to the white of the base. Specimens kept for months in daylight illuminated aquaria gradually become nearly the same grey-green throughout due apparently to a spread of algae to the more basal tissues. The difference in coloration of the upper and lower parts of a freshly collected specimen is indicated in Plate 1E. In the field only the upper third or half of the scapus extends above the sand or mud in which the anemone dwells, and it is only in this upper, more illuminated, part that the algae seem to thrive (Pl. 1, A). The scapus and proximal capitulum show 48 lines throughout their length which correspond with the 48 mesenteries present in these regions. The upper capitulum shows many more lines, up to and probably more than 384, corresponding to the many additional mesenteries present at the margin. Cinclides are present throughout the scapus, occurring most abundantly in the endocoels of the upper half of the scapus. The cinclides are perforate and in longitudinal sections of the column can be seen to occur as breaks in the mesogloea with both the ectoderm and endoderm becoming thinner and tapering to the actual pore. In life the cinclides of an expanded specimen can be seen as sometimes opaque but usually transparent minute specks. Acontia are readily emitted through the cinclides. The cinclides are not arranged in rings, and, being relatively scarce in the exocoels, give the impression of being in longitudinal rows.

In histological preparations, cut at from 2 to 8 microns and stained with Mallory's Triple Stain, a number of features are worth noting. There is a well developed circular, endodermal musculature throughout the column. The muscles occur on apparently permanent folds of mesogloea, and in contracted specimens these folds become much larger than in expanded ones. The uppermost capitulum possesses no, or only a few, such processes, and these processes seem in some specimens to be somewhat more numerous in the collar region than elsewhere. This concentration, however, is not discrete enough to be distinguished as an actual sphincter, although behaviourally this area acts as a sphincter and closes over the capitulum and tentacles as they are withdrawn (Pl. 1, A). The mesogloea may also appear somewhat, though very slightly, thicker in the collar region than elsewhere, but this is not obvious in all preparations. Numerous cells can be seen in the mesogloea, also perhaps slightly more numerous in the collar region than the general capitulum and scapus. The ectoderm of the capitulum is less glandular than that of the scapus but no differences in the endoderm were noted other than those of the musculature. Cinclides do not occur in the capitulum.

Oral Disc. Wider than the column when expanded and folded into about six undulating lobes in large specimens (Pl. 1, B). There is little tentacle-free area around the mouth. In the tentacle-free area numerous pairs of lines representing the mesenterial insertions show through the rather transparent tissues. Colour of the disc about the same grey-green as the capitulum and upper scapus. The white or cream coloured lips of the actinopharynx are heavily ribbed and the two siphonoglyphs can usually be seen. The number of ribs on the lips vary, there being about 24 in small specimens to about 48 in large ones. The lips usually are raised slightly above the level of the disc.

Tentacles. Regularly hexamerous in arrangement, with five to seven or eight cycles present. As far as can be determined the number of tentacles corresponds exactly to the number of mesenteries. A medium sized specimen (10 cm long by 3 cm diameter) had 384 mesenteries at the margin and apparently the same number of tentacles. Larger specimens appear to have more mesenteries and correspondingly more tentacles. The inner tentacles are longer than the younger, outermost ones, although most tentacles are of about the same length. On a large anemone an individual tentacle may be as much as 2.5 cm long, and all tentacles are gently tapered throughout their length. The tentacles are translucent when extended and of about the same colour as the capitulum and upper scapus. No special pigments, bands, bars or other markings occur on the tentacles. The very numerous fine tentacles and the lobed disc give the crown a rather frilly appearance (Pl. 1, B-E). As individual tentacles contract they sometimes appear to show a darker central area surrounded by a translucent outer layer. This appearance seems to result from the symbiotic algae present in the tentacular endoderm.

Mesenteries. In the 20 specimens examined the mesenteric pattern is constant and strictly hexamerous, which strongly suggests that this species does not reproduce asexually. Only six pairs of mesenteries are perfect, of which two pairs are directives and are attached to the two siphonoglyphs. The perfect mesenteries, including the directives, are fertile. These first order mesenteries bear from one to five acontia each, the acontia arising in linear sequence beyond the end of the filament. Most mesenteries possess more than a single

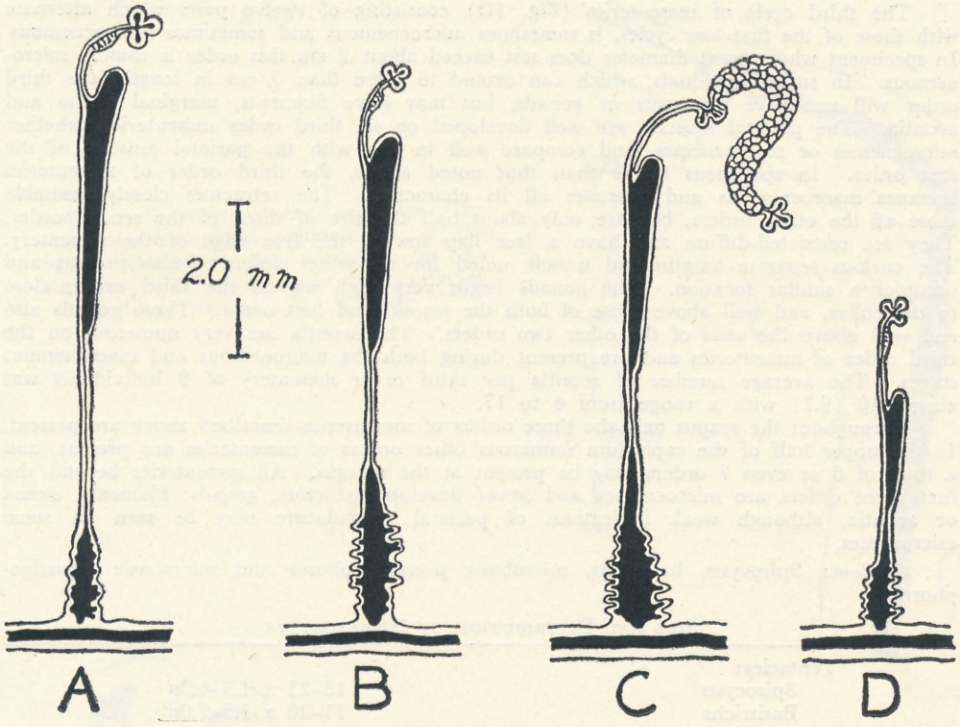


FIG. 1.—Macrocnemes of *Mimetridium cryptum* n.sp. The figures are diagrammatic scale drawings which do not show the detail of the mesogloeal lamellae of the retractors. A—A first order mesentery with a diffuse accessory muscle close to the filament. B—A second order mesentery with a diffuse accessory muscle. C—A fertile second order mesentery showing a restricted accessory muscle separated from the filament by the gonad. D—A third order mesentery with a very small accessory muscle.

acontium, the average of nine first order mesenteries from nine anemones being over three. The retractor muscles of the first order are large and somewhat restricted. The edge of the retractor toward the free edge of the mesentery is separated from the mesentery in a discrete flap (Fig. 1A), while the opposite end tapers off as in a diffuse retractor. Numerous algal cells occur throughout the endoderm of the mesenteries and even occur between the mesogloeal lamellae of the retractor. A small, but separate, longitudinal muscle facing in the same direction as the retractor occurs immediately behind the filament. This muscle, which has not been described from any anemone before, is variously developed on all macrocnemes and seems to vary from a diffuse to strongly restricted shape. The gonads develop between this muscle and the filament. The parietal musculature is well developed on the first order mesenteries and the mesogloea is much thickened in that area. The perfect mesenteries possess both marginal and oral stomata. The gonads of the perfect mesenteries begin shortly below the lower end of the actinopharynx and end near the base.

The second order of mesenteries is also always macrocnemous, never perfect, is fertile and possesses more acontia than the first order. The average number of acontia per second order mesentery, based on 9 specimens, was about 5 (4.8) with a range from 3 to 7. Marginal stomata only are present on the twelve second order mesenteries. The retractors of this order are restricted-diffuse and are about two-thirds as large as those of the perfect cycle. The parietal muscles are better developed on this second cycle than on the first, and the mesogloeal lamellae of the parietal muscles are longer (in cross-sectional view) and more branched (compare Fig. 1A and 1B). As in the perfect mesenteries there is a second longitudinal muscle running parallel to the retractor. The gonad separates this muscle from close proximity to the filament, and it seems to be in the area of the gonad that the muscle is best developed (Fig. 1C). The gonads of the second order start above those of the first and end higher up the column than those of the first. The exact point at which the gonads end seems to be determined by the state of maturity of the individual.

The third cycle of mesenteries (Fig. 1D) consisting of twelve pairs which alternate with those of the first two cycles, is sometimes microcnemous and sometimes macrocnemous. In specimens whose basal diameter does not exceed about 2 cm this order is usually micronemous. In such individuals, which can extend to more than 7 cm in length, the third order will not have retractors or gonads, but may have filaments, marginal stoma and acontia. The parietal muscles are well developed on all third order mesenteries, whether microcnemes or macrocnemes, and compare well in size with the parietal muscles of the first order. In specimens larger than that noted above, the third order of mesenteries becomes macrocnemous and possesses all its characters. The retractors closely resemble those of the other orders, but are only about half the size of those of the second order. They are restricted-diffuse and have a free flap toward the free edge of the mesentery. The curious separate longitudinal muscle noted for the other orders is also present and occupies a similar location. The gonads begin very high up on the third order, close to the collar, and well above those of both the second and first order. These gonads also end well above the ends of the other two orders. The acontia are very numerous on the third order of mesenteries and are present during both the micronemous and macronemous stages. The average number of acontia per third order mesentery of 9 individuals was almost 10 (9.7) with a range from 4 to 17.

Throughout the scapus only the three orders of mesenteries described above are present. In the upper half of the capitulum numerous other orders of mesenteries are present, and a total of 6 or even 7 orders may be present at the margin. All mesenteries beyond the first three orders are microcnemes and never develop retractors, gonads, filaments, stoma or acontia, although weak indications of parietal musculature may be seen on some micronemes.

Cnidom: Spirocysts, basitrichs, microbasic p-mastigophores and microbasic amastigophores.

Size and Distribution of Nematocysts

Tentacles:	
Spirocysts	13–25 x 1.5–4.0μ
Basitrichs	11–20 x 1.5–2.0μ
Microbasic p-mastigophores	23–29 x 4.5–5.5μ
Microbasic p-mastigophores (few)	7–11 x 2.0–4.0μ
Column (scapus):	
Basitrichs (few)	13–17 x 1.0–1.5μ
Basitrichs	21–25 x 3.0–4.5μ
Microbasic amastigophores	13–17 x 3.0–4.0μ
Microbasic amastigophores	22–28 x 4.5–5.0μ
Actinopharynx:	
Basitrichs	19–25 x 2.0–3.0μ
Microbasic amastigophores	22–26 x 3.0–4.0μ
Microbasic amastigophores	26–34 x 4.5–5.0μ
Microbasic p-mastigophores (few)	15–19 x 3.0–4.0μ
Filaments:	
Basitrichs	15–18 x 1.0–1.5μ
Microbasic amastigophores	34–52 x 5.0–7.0μ
Microbasic p-mastigophores	11–14 x 4.0–5.0μ
Microbasic p-mastigophores	17–23 x 3.5–4.5μ
Acontia:	
Basitrichs	13–19 x 1.0–1.5μ
Basitrichs	17–25 x 3.0–4.0μ
Microbasic amastigophores	52–68 x 6.0–7.5μ
Microbasic amastigophores (few)	15–21 x 3.0–4.0μ

Size. The sizes of some small to medium specimens are indicated in Plate 1, which is reproduced at life-size. In the field small specimens whose length is barely 2 cm have been encountered as have very large specimens capable of expanding to at least 30 cm long. One large specimen in the preserved condition had the following measurements: 13 cm tall, 7 cm diameter base, 8 cm diameter mid-column, 9 cm diameter crown, 4.5 cm diameter at collar.

Localities and Habitat. This species is locally abundant near the Portobello Marine Biological Station in Otago Harbour. There is a large colony living in the shade of a beached hulk on Quarantine Island (also known as St. Martin's

Island) and individuals can be seen beneath the wharves at Port Chalmers. Other specimens have been collected at Weller's Rocks and isolated individuals have been seen, or collected from various other localities. Within the intertidal zone the species is quite rare except in shaded situations such as under wharves or alongside the hulk mentioned above, although occasional isolated individuals may be seen in completely unshaded positions. This anemone occurs from about the level of the low water of neap tides well into the subtidal. The most numerous population noted to date occurs between about the low water level of neap tides down to that of spring tides in the shade of the old hulk on Quarantine Island. The substrate in which the species lives is usually a muddy sand with rather numerous bivalve shells, pebbles and small stones present. It is to these latter items that the anemones attach, although occasional individuals, especially the smaller ones, seem not to be attached. In their natural habitat they usually live partially buried in the substrate, although some individuals, particularly smallish ones, may be found hanging from the underside of the old hulk. The base of the anemone may be attached from a few to 15 cm or more beneath the surface, depending upon the size of the individual, and only the upper third or half of the animal is to be seen above the surface of the substrate.

TYPE LOCALITY. Otago Harbour, N.Z.

HOLOTYPE. The holotype is the specimen photographed in life and shown in Plates 1, C and 1, D. In the preserved, semi-relaxed, condition it measures 9 cm long by 3.5 cm diameter at mid-column. The specimen has been deposited in the Otago Museum.

PARATYPES. Three specimens have been deposited at each of the following institutions:

(1) The Otago Museum.

(2) The British Museum (Nat. Hist.).

(3) The United States National Museum.

DISCUSSION. The trivial name, *cryptum,* given to this species is meant to refer to the rather crytic or shaded places in which the animal occurs. The species is probably a subtidal one and appears to live in the intertidal area almost exclusively in positions which guarantee it a minimal exposure to full sunlight.

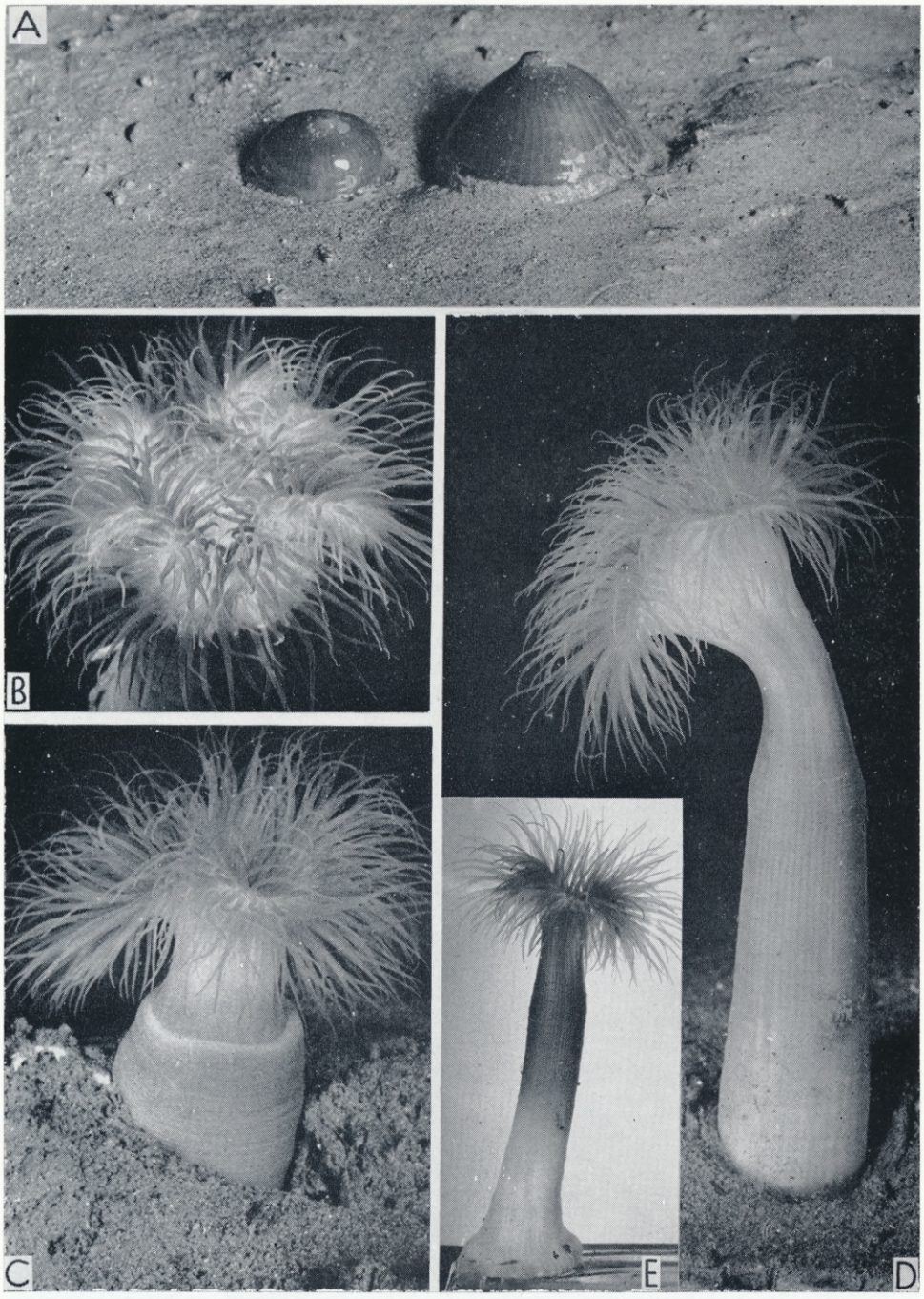
The study of this animal has revealed a most interesting fact regarding the division of mesenteries into microcnemes and macrocnemes. Here it has been found that the course of development clearly proceeds from the micro-macrocnemous to the cyclical state, and if one were to examine only fully adult individuals one could not have made a correct family assignment for this species. Stephenson (1928, p. 52) noted that it was not always clear whether one was dealing with graded cycles of mesenteries or with those which possess two clear-cut types, and Carlgren (1949, p. 86) in his key to the Acontiaria used the wording, " Mesenteries divisible into macro- and microcnemes more or less distinctly ", to express this difficulty. In the phylogeny of the anemones it appears that the development of cycles of mesenteries appeared later than the micro-macrocnemous condition, and the systematic arrangement of the Actiniaria of both Stephenson and Carlgren is an implicit acceptance of this. It was interesting, therefore, to find an anemone which in its development recapitulates the suggested phylogeny of mesenteries from one mode of arrangement to another, and by this seems to reinforce the correctness of our interpretation of evolution within the group.

In another fashion, too, this anemone may help better to interpret actinian evolution. The acontiate anemones are separable into two groups; one being the 3 families of acontiate Athenaria, anemones without basilar muscles, and the second the 11 families of acontiate Thenaria, anemones with basilar muscles (see

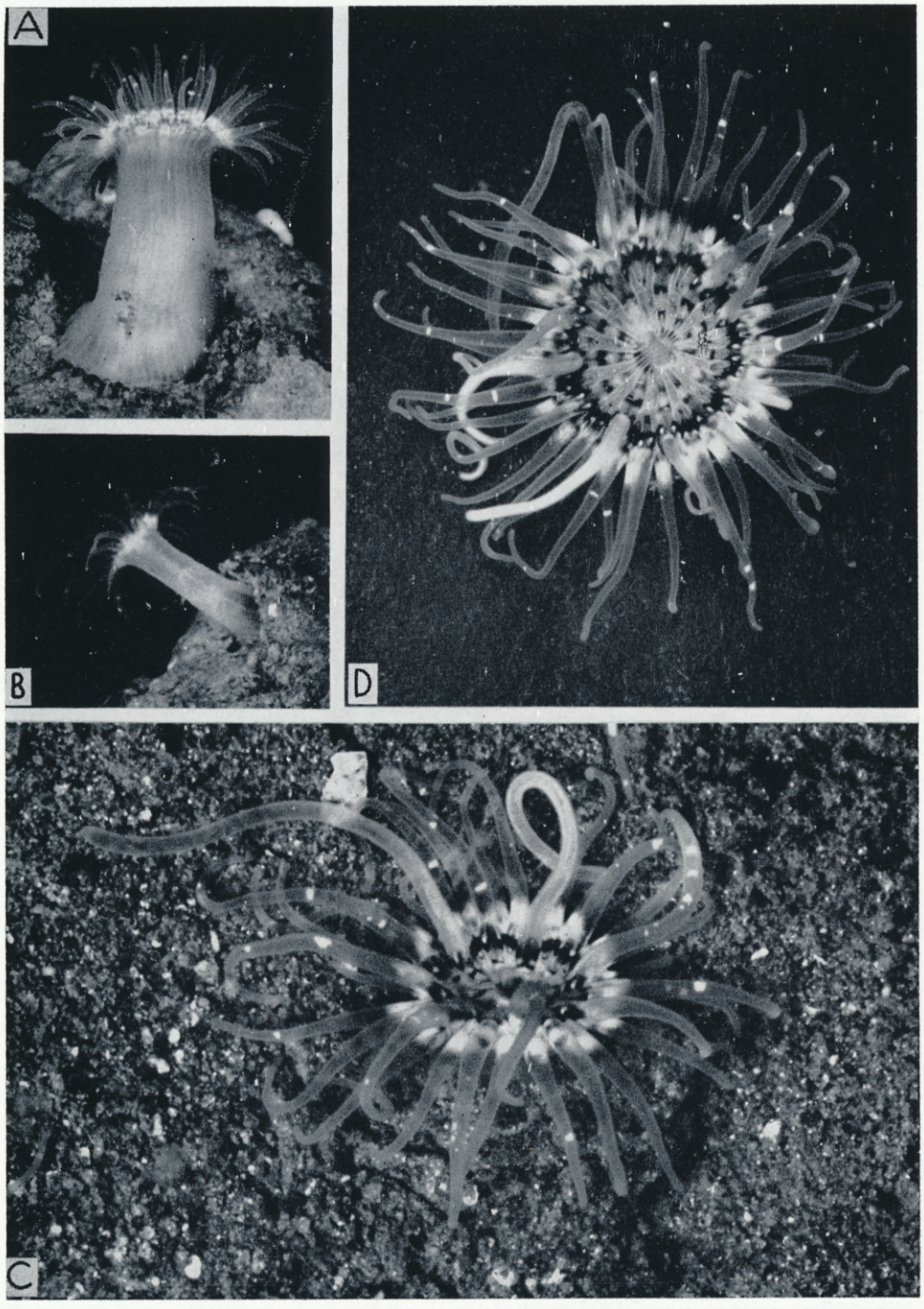
Carlgren, 1949, and Hand, 1956, for families concerned). The manner in which these two groups may be related has long been a puzzle. Stephenson (1920, p. 444) was of the opinion that all forms possessing acontia were descended from a common ancestor, while the arrangement of families in Carlgren's (1949) "Survey" suggests that the acontiate thenarians are a more recent than early evolutionary development. *Mimetridium,* except for its possession of basilar muscles, could readily be classified as a member of the Haliactiidae, an athenarian family, and it is of interest that 2 genera of haliactiids, *Pelocoetes* and *Phytocoetes,* were originally thought to be members of the genus *Metridium.* These latter misidentifications resulted, as in the instance of *Mimetridium,* from the similarity in external appearance of the forms to *Metridium.* In the present case, however, it is intriguing and of possible significance how closely *Mimetridium* approximates the *haliactiids.* The cnidom, nematocysts of the acontia, general mesenterial arrangement, distribution of gonads, rows of cinclides, habit of burrowing and living partly buried, and even the numerous acontia (as in the haliactiid *Phytocoetopsis*) are all haliactiid-like. Certain haliactiids, such as *Pelocoetes,* also have lobed oral discs. These similarities, taken together, may be interpreted as suggesting that *Mimetridium,* a thenarian, is closely related to the athenarian acontiates, most particularly to the haliactiids. At exactly what time or in what group a true base with basilar muscles first evolved cannot be answered; however, if we accept that the Athenaria are more primitive than the Thenaria, then the acontiate thenarians should take their place close to the stem of the Thenaria. An alternate possibility is that the acontiate athenarians represent a group evolved from the Thenaria with a loss of basilar muscles. If the view that the acontiate thenarians are the most primitive of the Thenaria is accepted, then one must also accept that the non-acontiate Thenaria are derived from those with acontia. Our other choice here is to propose a polyphyletic origin for the Thenaria. It is clear that there are at present several, essentially equally plausible paths which can be suggested as outlining the evolutionary steps discussed above, but from the study of *Mimetridium* it also is evident that a close relationship must be recognized between the athenarian and thenarian acontiate anemones.

In working on this anemone it was originally assumed that the form described by Parry (1952, p. 133) as *Metridium canum* was the same as the Otago Harbour form. This impression was arrived at because of the apparently identical habitats, appearance (including colour and lobed or undulating disc) and by all of the comments Parry makes referring to external characters. Unfortunately, Parry did not deposit types or reference specimens of this or other anemones described by her, nor did a visit to the Heathcote Estuary, guided by a map sketched by Parry, yield any specimens of *M. canum.* From information provided by a resident near the site of the "old boat slipway" where Parry collected *M. canum,* it was learned that there has been much deposition of silt in the area, and it appears that there has been considerable filling around the slipway. If *M. canum* of Parry still exists in the Heathcote Estuary area, it must occur elsewhere than described by her. While in that area a search of other likely locations was made by myself and Dr. E. J. Batham, but to no avail.

If one compares the description provided herein of *Mimetridium cryptum* with Parry's description of *Metridium canum,* one will note several striking differences. For example, Parry records a mesogloeal sphincter, a sterile first order of mesenteries but an additional 3 or more fertile cycles and no cinclides. In contrast, I have found no sphincter, three cycles of fertile mesenteries (including the first cycle), no additional mesenteries (i.e., no more in the area where gonads occur) and cinclides. Moreover, the nematocysts reported in the two descriptions do not compare well. Dr. Parry (now Dr. Howells) has kindly sent a microscope slide she prepared to Dr. Batham, and I have examined the longitudinal serial sections it contains. That preparation shows the anemone it was made from had no



Mimetridium cryptum n.sp. All individuals are reproduced at natural size, and C. and D represent the holotype before preservation. A—Two contracted individuals at low tide in the field. B—The lobed oral crown. C—The holotype showing the collar. The invisible buried portion is about as long as the visible portion. D—The holotype well elongated and with the collar smoothed away. E—A small specimen to show the full length of the column and the base.



Flosmaris bathamae n.sp. (A and B, about 4 times natural size; C about 8 times natural size; D, about 6 times natural size.) A—A medium sized individual. B—A small, but well elongated individual. C—Oral view of a small individual with an expanded catch tentacle and two, white, more contracted, catch-tentacles. D—The oral disc and tentacles to show the colour pattern. Note the expanded catch-tentacle and the two, white, contracted ones.

sphincter but did have cinclides in the scapus, thus two of the discrepancies in our descriptions are resolved. No information on nematocysts or distribution of gonads could be obtained from the slide.

Dr. Batham sent Dr. Howells a Kodachrome transparency of two specimens of *Mimetridium cryptum*, 5 negatives of the species in various poses, and a positive photograph of the anemones in the field. In her return letter to Dr. Batham, Dr. Howells says that the photographic representations look like the animal she had from the Heathcote Estuary. Thus, while we lack conclusive proof that the two described anemones are the same, it seems reasonable to conclude that they are.

It is worth noting, too, that Parry's identification of her species with Stuckey's (1914, p. 134) *M. canum* seems most unlikely. The Kermadec Islands lie some 700 miles north of the North Island of New Zealand, and, while many species are shared by the Kermadecs and New Zealand, the former is located in a subtropical area (ca. 32 south latitude) as compared to the more temperate or cold ocean in the Banks to Otago Peninsula area (43 to 46 south latitude). Moreover, Stuckey's species was very small, his largest specimen being less than 1 cm long which would be minute as compared to the average *Mimetridium*. The habitat, "abundant on the undersides of stones", also is strikingly different from that of either the Heathcote Estuary or Otago Harbour representatives. Therefore, I feel, we must leave *M. canum* Stuckey as a questionable species of *Metridium*.

Further collections of anemones, both in the Kermadec Islands and in the Heathcote Estuary and surrounding areas, are sorely needed if we are finally to resolve the question of whether or not veritable species of *Metridium* occur in the southern hemisphere. Since requests for the type specimen of *M. canum* which were sent out to the several N.Z. museums, and to the British Museum as well, have only produced the information that that type is not in any of those institutions, it appears that the actual identity of *M. canum* from the Kermadec Islands can only be answered by fresh field collections and their critical study.

PART II. *Flosmaris bathamae* n.sp.

While collecting specimens of the anemone *Mimetridium cryptum* Hand in the shade of an old hulk beached on Quarantine Island (Otago Harbour, N.Z.), a small anemone was discovered buried in the sand along with the *Mimetridium*. Upon examination this small anemone proved to be an undescribed isophelliid of the genus *Flosmaris*. Since both the family Isophelliidae and the genus *Flosmaris* are new to the New Zealand fauna, the definitions of these groups as found in Carlgren (1949, pp. 88–89), are given below, although the generic diagnosis is changed slightly.

Family ISOPHELLIIDAE Stephenson 1935, p. 183.

Thenaria (Acontiaria). Sphincter mesogloeal. Mesenteries divisible into macro- and microcnemes; the older microcnemes may, however, be provided with filaments and acontia. Acontia with two categories of nematocysts, basitrichs and microbasic amastigophores.

Genus FLOSMARIS Stephenson 1920, p. 441

Isophellidae with the elongate column divisible into scapus and scapulus, the former with tenaculi. Cinclides present or possibly absent. Margin tentaculate. Tentacles simple, their longitudinal muscles ectodermal as are the radial muscles of the oral disc. Sphincter mesogloeal; situated in the upper part of the scapulus. Twelve pairs of macrocnemes bearing gonads, though the number may vary as the result of asexual reproduction. Macrocnemes all perfect and with strongly restricted to circumscribed retractors. Microcnemes weak, consisting chiefly of parietal muscle. Acontia present on the macrocnemes and sometimes on some microcnemes. Cnidom: spirocysts, basitrichs, microbasic amastigophores and atrichs and holotrichs as well if catch-tentacles are present.

The generic diagnosis given above has been slightly changed, and added to, to conform with the findings made in the study of the species to be described. Stephenson (1920, p. 442) did not find cinclides, although they are present in the

N.Z. species, and in some specimens of the N.Z. species more than 12 pairs of mesenteries are fertile. This latter situation seems to be arrived at as a result of the development of more than 12 pairs of perfect macrocnemes following asexual reproduction. I have not found acontia on any microcnemes, while Stephenson did. The generic definition has, therefore, been slightly modified to account for the differences in cinclides, numbers of fertile mesenteries and acontia. I also have added the cnidom to the definition.

Flosmaris bathamae Hand, new species.

DESCRIPTION. (See Plate 2 and Figs. 1 and 2.)

Base: Generally circular, adherent and the same size as or larger than the scapus. As specimens are collected in the field, the base is usually several times larger than the scapus immediately above it and is attached to small stones, shells or larger stones which are buried 1 cm or more beneath the surface. Basilar muscles present and well developed.

Column: Elongate, divided into scapus and scapulus, cylindrical and up to about 2.5 cm long by 3–4 mm diameter as maximum dimensions. The shape of specimens as collected is markedly goblet-like; the tentacles and scapulus are withdrawn, while the upper half of the scapus is expanded and the lower half is contracted in diameter. The flaring base completes the similarity in appearance to a goblet. Once animals are removed from their natural surroundings and established in aquaria, the column assumes an elongate form of much the same diameter throughout its length (Plate 2, A-B). The column is colourless or a pale white, and is translucent to transparent, depending on the degree of contraction or expansion of the individual. The mesenterial insertions are visible as pale white lines.

The scapulus is short, representing ⅕ or less of the total column, and may be distinguished from the scapus by its slightly greater transparency. In histological preparations the scapulus is thinner than the scapus due to a thinning of all layers involved. The scapulus possesses fewer gland cells than the scapus and no cinclides or tenaculi.

Numerous tenaculi, which adhere to sand grains and other objects, are present in the upper ⅓ of the scapus, but are scarce elsewhere. Cinclides are abundant in the mid-scapus area, are perforate and are formed by an abrupt break in the ectoderm and mesogloea accompanied with a gradual thinning of the endoderm as the area of the cinclides is approached. The mesogloea of the scapus is relatively thin, being about ½ as thick as the ectoderm and ⅔ as thick as the endoderm.

A small, reticular, mesogloeal sphincter (Fig. 2) is present at the top of the scapulus and immediately adjacent to the tentacle bases. The sphincter consists of a few (2 to 4) groups of muscle-cells, each group being separated from the ectoderm, endoderm and each other by a very thin layer of mesogloea. At the distal end of the sphincter the total thickness of the mesogloeal layer changes abruptly to the thin mesogloea of the tentacles.

Circular, endodermal muscles are present throughout the length of the column but are not particularly well developed. The mesogloeal processes on which the circular muscles occur are low and unbranched.

Tentacles and Oral Disc: Two sorts of tentacles, regular ones and catch-tentacles (Pl. 2, C-D), are present on some individuals, although most specimens do not possess catch tentacles. From 48 to as many as 72 regular tentacles and 1 to 4 catch-tentacles have been counted on various individuals, the inner tentacles being longer than the outer. Tentacles commonly hexamerously arranged, although irregularities apparently resulting from asexual reproduction are common. Individual regular tentacles can extend to about 8 mm in length, and the total crown may be 2 cm in diameter in a large individual. Catch-tentacles can extend to at least 1.5 cm in length. The regular tentacles are thin, gently tapered and transparent. Catch-tentacles are opaque and tapered when contracted, but become transparent, nearly the same diameter throughout, and end bluntly when expanded (Pl. 2, C-D).

The only distinctive coloration to be found on the whole animal consists of the colours of the tentacles and oral disc. The tentacles have bars or incomplete rings of white granules on the oral side just above their bases, while the distal ⅕ may not be marked at all, or may show a random spot of white here or there. In the area where each tentacle joins the disc there is no pigment, or there are pairs of minute white spots (see dark patches and white spots representing this area of the tentacles in Pl. 2, C-D). On the disc the endocoels may be white, may have several white patches, or may be unpigmented, while the exocoels are usually lightly pigmented with white, but they too may be unpigmented. When magnified, each mesenterial insertion on the disc can be seen to be bordered by rows of dense white granules and thus appears as a pale line. Plate 2, D shows the mesenterial insertions but does not show the double nature of the lines. The lips are seldom seen raised above the level of the disc, and are smooth and unpigmented, as is the area immediately around

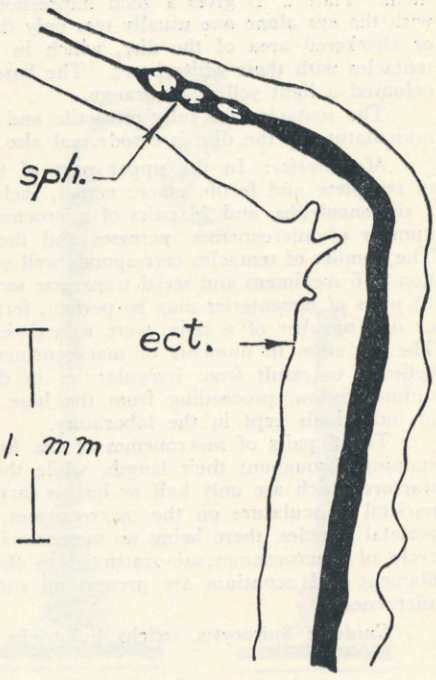


FIG. 2.—*Flosmaris bathamae* n.sp. The reticulate mesogloeal sphincter is at the upper left where the mesogloea of the scapulus thins as it meets the tentacles. (ect., ectoderm; sph., sphincter.)

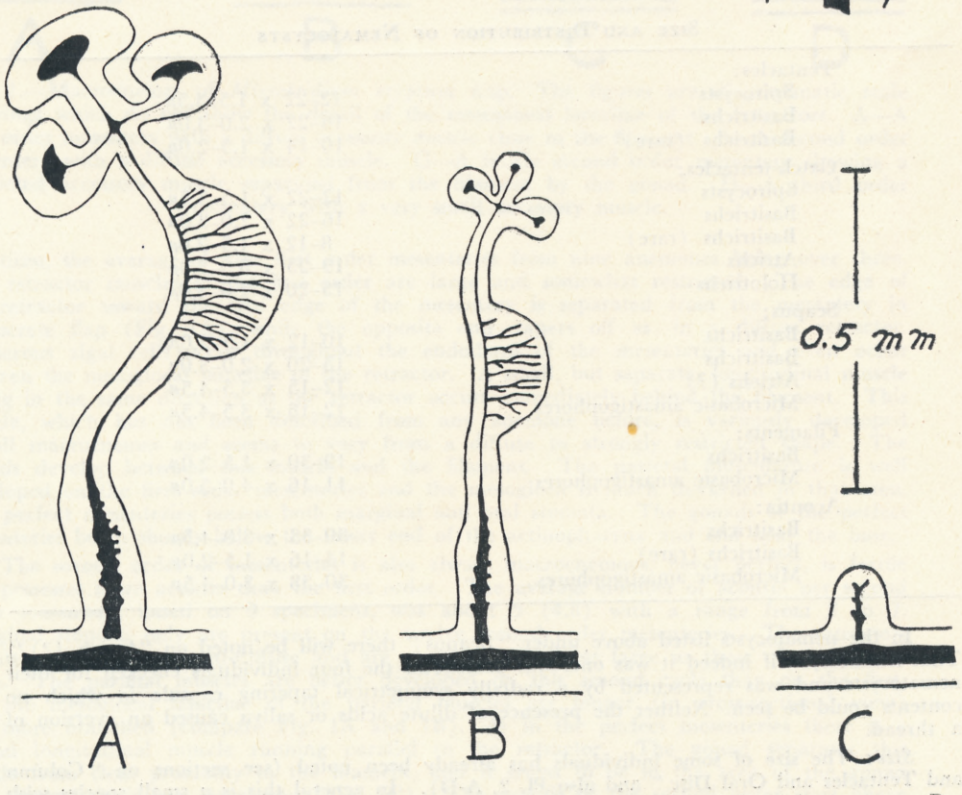


FIG. 3.—The mesenteries of *Flosmaris bathamae* n.sp. A—A first order macrocneme. B—A second order macrocneme. C—A microcneme.

them. Plate 2, D gives a good impression of the appearance of the disc and tentacles, but with the eye alone one usually sees only the pale mouth area, surrounding that a solid white or checkered area of the disc, which in turn is surrounded by a clear area and then the tentacles with their white bases. The bases of the directive tentacles on some anemones are coloured a light yellow or orange.

The tentacles are fully retractile and have ectodermal longitudinal muscles. The radial musculature of the disc is ectodermal also.

Mesenteries: In the upper part of the body of perfect specimens there are 12 pairs of complete and fertile macrocnemes, including 2 pairs of directives that correspond to the 2 siphonoglyphs, and 24 pairs of microcnemes. In the scapus, especially its lower parts, the number of microcnemes increases and there are more mesenteries proximally than distally. The number of tentacles corresponds well with the number of mesenteries at the base. Dissection of 6 specimens and serial transverse sections of a seventh specimen revealed that 12, 14 or 16 pairs of mesenteries may be perfect, fertile macrocnemes; however, some mesenterial pairs, or one member of a pair, were sometimes found to be fertile but imperfect macrocnemes. The variation in numbers of macrocnemes and the presence of incomplete macrocnemes is believed to result from irregularities in development following longitudinal fission. Longitudinal fission, proceeding from the base upwards, has been observed on several occasions in individuals kept in the laboratory.

The 6 pairs of macronemes of the first cycle have large restricted retractors (Fig. 3A) running throughout their length, while the second cycle (Fig. 3B) has fairly restricted retractors which are only half or less as large as the earlier ones. There is a well developed parietal musculature on the macrocnemes, and the microcnemes (Fig. 3C) consist only of parietal muscles, there being no mesenterial sheet. The retractors and gonads of the second cycle of macrocnemes are restricted to the upper half of the scapus. A trifid mesenterial filament and acontium are present on each macrocneme, but were never observed on any microcneme.

Cnidom: Spirocysts, atrichs, holotrichs, basitrichs and microbasic amastigophores.

SIZE AND DISTRIBUTION OF NEMATOCYSTS

Tentacles:	
Spirocysts	12–22 x 1.5–3.5μ
Basitrichs	16–22 x 2.0–3.0μ
Basitrichs (rare)	10–14 x 1.5–2.0μ
Catch-tentacles:	
Spirocysts	12–22 x 1.5–3.5μ
Basitrichs	16–22 x 2.0–3.0μ
Basitrichs (rare)	8–12 x 1.5–2.0μ
Atrichs	19–25 x 6.0–7.0μ
Holotrichs	15–20 x 2.0–4.0μ
Scapus:	
Basitrichs	10–12 x 1.5–2.0μ
Basitrichs	15–20 x 2.0–3.0μ
Atrichs (?)	12–15 x 3.5–4.5μ
Microbasic amastigophores	12–16 x 3.5–4.5μ
Filaments:	
Basitrichs	19–30 x 1.5–2.0μ
Microbasic amastigophores	11–16 x 4.0–5.0μ
Acontia:	
Basitrichs	30–33 x 3.0–4.5μ
Basitrichs (rare)	14–16 x 1.5–2.0μ
Microbasic amastigophores	30–38 x 3.0–4.5μ

In the nematocysts listed above under "Scapus" there will be noted an "Atrich (?)". That nematocyst, if indeed it was one, was present in the four individuals checked for their nematocysts and was represented by a radially symmetrical tapering capsule in which no contents could be seen. Neither the presence of dilute acids or saliva caused an eversion of a thread.

Size: The size of some individuals has already been noted (see sections on "Column and Tentacles and Oral Disc" and also Pl. 2, A-D). In general this is a small species with an average sized individual being about 1.5 cm long by 3 mm diameter when well extended and expanded. The tentacular crown on such an individual would be about 7 mm in diameter.

The largest individual noted to date was about twice as large as the above.

LOCALITY AND HABITAT. The only individuals discovered to date have been found alongside an old hulk on Quarantine Island (St. Martin's Island) in Otago Harbour. However, the small size and inconspicuous appearance of this species have probably resulted in its so far having been overlooked elsewhere. The individuals are very numerous, up to 17 having been noted in an area of approximately 8 x 8 cm. Individuals have been seen slightly below the level of low water of neap tides to well above this. The area is well shaded by the old hulk and specimens of *Mimetridium cryptum* and *Edwardsia tricolor* occur along with it. The substrate in the area is a muddy sand with numerous bivalve shells, pebbles and small stones present. It is to these items that the anemones attach. When the tide is out the anemones remain expanded and, on close examination of the substrate, appear as small white spots. Any disturbance tends to cause a sudden withdrawal of the crown from view, usually leaving a hole or small depression as the only visible record of its presence. When the tide covers the anemones they may extend their crowns a few mm above the substrate. From observations on specimens established in a nearly natural situation in the laboratory it appears that it is only the scapulus which extends above the surface.

TYPE LOCALITY. Otago Harbour, N.Z.

HOLOTYPE. The holotype has been deposited in the Otago Museum. It is a specimen 1.2 cm long by 5 mm diameter at the base.

PARATYPES. Three specimens have been deposited at each of the following institutions:

(1) The Otago Museum.

(2) The British Museum (Nat. Hist.).

(3) The United States National Museum.

DISCUSSION. The only other species of *Flosmaris* described so far is *F. phelliodes* Stephenson (1920, p. 441). That description was based on a single specimen obtained from Professor J. Stanley Gardiner and labelled "Hulule: sand—close to low tide". After considerable search in atlases, which failed to provide the location of Hulule, that place was finally located in the Maldive Islands from a map in Prof. Gardiner's 1931 book "Coral Reefs and Atolls". The Maldive Islands lie north of the equator, to the south-west of the southern tip of India. Thus *F. phelliodes* is known only from the tropics while *F. bathamae* is known only from the cold-temperate waters of southern New Zealand.

Stephenson's (1920) description of *F. phelliodes* agrees with my description of *F. bathamae* in many respects, but it also differs in certain important features. Stephenson found circumscribed retractors as compared with the strongly restricted retractors of *F. bathamae*. He also found the retractors of the first and second order macrocnemes of about the same size, while they are strikingly dissimilar in size in the new species. Of perhaps greater significance is Stephenson's comment (1920, p. 443): "In the uppermost part of the body some additional microcnemes, over and above the twelve pairs visible on dissection are present". This information was based on a study of sections of the upper part of the body and contrasts sharply with the condition in *F. bathamae* where more mesenteries are present proximally than distally. In many families of anemones a difference of this sort is used as one of the generic distinctions; however, since the genus *Flosmaris* was based on a single specimen, and it and the individuals of the new species agree so closely, it does not seem wise to establish a new genus for the present form on this character alone. For example, the distribution of tenaculi, the very sharp division into macrocnemes and microcnemes, the shorter second order macrocnemes, the ectodermal musculature of tentacles and disc, the well developed parietal muscles, the mesogloeal sphincter (including its location), the absence of cuticle and the

tentaculate margin all seem identical. Interestingly, too, in both species there is some variation in the sizes of the retractors in the members of a pair, and the 8 Edwardsia-mesenteries have their endings of gonad and retractor slightly lower down than the other 4 primary mesenteries.

In summary of the comparison of the two species it may be noted that *F. phelliodes* differs from *F. bathamae* in the following features which serve clearly to distinguish them as species:

F. phelliodes	*F. bathamae*
No cinclides (?)	Cinclides present
Microcnemes with acontia	Microcnemes without acontia
No catch-tentacles (?)	Catch-tentacles present
More mesenteries distally	More mesenteries proximally
Circumscript retractors	Restricted retractors
First and second order retractors same size	First and second order retractors of different size
Tropical Indian Ocean	Cold-temperate South Pacific Ocean

Stephenson did not report on the nematocysts of his species nor did he note the number of tentacles or size of his specimen. Therefore we cannot compare the species on these characters. Also, since but a single specimen of *F. phelliodes* is known, it is obvious that a study of more individuals is needed, and such a study may reveal either that the two are in fact the same species or that a new genus is needed for the present species. I can only conclude, however, from the data available to me that the two are distinct species of *Flosmaris*.

The presence of catch-tentacles in *F. bathamae* is interesting in that it further emphasizes that these curious structures, whose function remains unknown, should not be considered of systematic importance. Up to 1956, catch-tentacles were thought to be unique to the family Diadumenidae; however, in that year Hand (1956, p. 191) reported their presence in the Metridiidae (in *M. senile fimbriatum*). Their presence in *Metridium* was then used to justify the uniting of the famiilies Diadumenidae and Aiptasiomorphidae since these two differed only in that the diadumenids possessed catch-tentacles (see Hand, 1956, p. 222). Therefore, the presence of catch-tentacles in still another family of acontiate anemones, the Isophelliidae, would seem to re-enforce the correctness of that systematic change. It should be noted here that even another acontiate family, the Sagartiidae, possess catch-tentacles. I first noted them in live specimens, and verified their presence by examination of nematocysts, in an orange sagartiid which is common in Otago Harbour. This new species is being described by Mr. Charles Cutress of the United States National Museum. The presence of catch-tentacles in the Sagartiidae was clearly to have been expected since Stephenson (1935, p. 189) in discussing catch-tentacles, said: ". . . . elongation of a few tentacles, in *Sagartia* and *Cereus*, is a familiar occurrence, and when these tentacles shorten down again, they are apt to be thicker and more opaque, for a time, than is normal." Stephenson also notes in a footnote on the same page that tentacles whose behaviour was like that of catch-tentacles have been seen in *Actinothoe anguicoma* and *Sagartia troglodytes*. All of these anemones are sagartiids, and while there is no absolute evidence in the form of data on nematocysts or histological differences that these were catch-tentacles, the descriptions of their behaviour certainly suggests that they were. As it stands now we know catch-tentacles to be present in the Diadumenidae, Metridiidae, Isophelliidae and Sagartiidae, and it seems highly possible that they will be found in still more acontiate families. Thus, rather than being characters of importance at the family level, catch-tentacles have become only one additional feature of the species of Acontiaria and, like the presence of acontia themselves, serve only to make the group a more coherent one.

ACKNOWLEDGMENTS

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